SPACE LAUNCH INITIATIVE

Technology Summary

Airframe Systems Technology

NASA's Space Launch Initiative (SLI) is poised to revolutionize space travel. A focused investment in risk reduction and technology development, SLI is a comprehensive, long-range plan to increase the safety, reliability and affordability of space transportation systems, including access to the International Space Station.

Whether it is doing business in Earth orbit or exploring distant worlds, the toughest part of the journey is the first couple of hundred miles of the journey through the atmosphere to and from space. Consequently, it is critical that the airframe of any future vehicle be optimized for safety, cost and performance while incorporating minimum weight – the classic aerospace dilemma.

NASA's Langley Research Center in Hampton, Va., is world renowned for its research into the performance of space vehicles. Langley scientists, engineers and technicians have done pioneering work on hypersonic gliders, the X-15 rocket plane, and the nation's Space Shuttle Orbiter. Furthermore, it has experience from the days of Mercury, Gemini and Apollo to today's X-vehicle programs. Continuing this tradition, and leveraging the Center's unique facilities and state-of-the-art tools, the Agency is looking to Langley to lead the development and demonstration of airframe technologies for SLI.

Airframe technologies include the development and optimization of structures such as wings, fuselages and tanks with minimum weight and maximum strength; and the design and assessment of the vehicle aerodynamics and aerothermodynamics, which control the loads and temperatures to which the vehicle will be subjected. Langley has experience in understanding the fabrication and behavior of light-weight metallic and composite structures. Langley also has wind tunnels, which can assess vehicles across the entire speed range. Center researchers also have specialized expertise in cryogenic tanks, able to hold fuel such as liquid hydrogen at very cold temperatures, as well as expertise in high-temperature metallic thermal protection systems. As part of the SLI airframe project, the Marshall Space Flight Center in Huntsville, Ala., will lead the development of the cryotanks and Ames Research Center at Moffett Field, Calif., will lead the development of the thermal protection systems (TPS).

Vital to attaining the SLI goal of safety, reliability and affordability is the development of a reusable launch vehicle (RLV) – "reusable" being the key word here. Toward this end, the focus of the airframe systems team is on developing and demonstrating:

- advanced airframe design and integration methods to improve reliability and reduce design cycle time
- robust, low-cost, low-maintenance structures, tanks, thermal protection systems and thermal structures
- aerodynamic and aerothermodynamic assessments which yield higher-fidelity information early in the design process

Langley also has a significant role in Systems Engineering and Analysis, which will help define the technologies that are required to meet the goals of the Space Launch Initiative. The Hampton facility is also supporting the Johnson Space Center in Houston in the development of advanced cockpit technologies to improve safety and reliability.

The Marshall Space Flight Center leads the Space Launch Initiative with support from Langley; Ames Research Center in Moffett Field, Calif.; Stennis Space Center in Bay St. Louis, Miss.; Kennedy Space Center, Florida; Dryden Flight Research Center in Edwards, Calif.; Johnson Space Center in Houston; Glenn Research Center in Cleveland; the Jet Propulsion Laboratory in Pasadena, Calif.; and the Air Force Research Laboratory, which includes research and development facilities at nine United States Air Force bases nationwide.